# Alternatives Analysis Workshop on Life Cycle Impacts and Exposure Assessment

## Course Outline

### 1. Course Objectives

To introduce life cycle concepts and analysis; to introduce exposure modeling and exposure assessment; to understand the basic concepts of uncertainty analysis.

### 2. Introduction to Safer Consumer Products Alternatives Analysis (AA)

Covered topics:

- Overview of AA process
- Differences of and connections to AA with other existing frameworks to evaluate alternatives for consumer products (i.e., Alternatives Assessment, Life Cycle Assessment (LCA), and Risk Assessment (RA))
- Summary of information required for AA Reports

### 3. Overview of Life Cycle Concepts and Tools

This section will cover the basic life cycle concepts and approaches to evaluate life cycle impacts. It will also discuss how life cycle based tools and analysis can help to support identification of relevant factors based on existing literature and databases and evaluation of multimedia life cycle impacts.

Covered topics:

- Life cycle thinking
- Components of Life Cycle Assessment
- Overview of life cycle based tools
- How life cycle based tools can support AA (e.g., “relevant factor” determination, evaluation of life cycle impacts)

## 4. Overview of Exposure Assessment Concepts and Tools

This section will cover the basic concepts of exposure assessment and approaches. It will also discuss how qualitative and quantitative tools can help to support identification of exposure pathways and evaluation of adverse impacts.

Covered topics:

- Overview of exposure assessment concepts
- How exposure assessment approaches can support AA
    - Identify exposure routes (ingestion, inhalation, dermal)
    - Indoor exposure modeling concept and tools (e.g., ConsExpo)
    - Outdoor exposure modeling concept and tools (e.g., EUSES)

## 5. Application of Life Cycle and Exposure Assessment Tools to AA

This section will recap the connections and differences between LCA, RA, and AA, and then discuss how to use the available LCA and RA data sources, tools, and models to address the requirements in AA.

Covered topics:

- Identification of relevant factors
- Exposure assessment
- Life cycle impact
- LCA and RA tools and databases
- Limitations of current approaches

## 6. Hands-On Examples: Application of Life Cycle and Exposure Assessment Tools to Sample Substances

This audience will run simplified Life Cycle Inventory (LCI) analysis and Life Cycle Impact Assessment (LCIA) for sample chemicals. The audience will also be shown how to accomplish a simplified fate, transport, and exposure assessment for those chemicals. Furthermore, the audience will perform uncertainty analysis for these previous examples. The hands-on exercises will be implemented using an MS Excel or web-based tool.

Covered topics:

- Hands-On Examples: Application of Life Cycle based Tools to Sample Substances
    - Exercise #1: LCI calculation - Users will use unit process data to compute LCI and identify relevant factors (40 mins)
    - Exercise #2: LCIA - Users will use characterization factors to calculate life cycle impact results and identify major contributors (40 mins)

- Hands-On Examples: Application of Exposure Assessment Tools to Sample Substances
    - Exercise #3: Release estimation – Users will use simple information to estimate the release quantities to the environment and identify relevant exposure factors (40 mins)
    - Exercise #4: Exposure calculation – Users will calculate the exposure concentrations (40 mins)

- Hands-On Examples: Uncertainty Analysis to Sample Substances
    - Exercise #5: Uncertainty analysis of sample substances for life cycle impacts (45 mins)

## 7. Advanced Topics

An in-depth discussion of developing topics relevant to AA.

Covered topics:

- Data gaps and quality assessment
- Qualitative and quantitative uncertainty analysis